

CYPRESS--GUM SWAMP (BLACKWATER SUBTYPE)

Concept: Cypress–Gum Swamps are wet forests dominated by combinations of *Nyssa* and *Taxodium*, flooded for long periods by overbank flow from rivers or streams. The Blackwater Subtype covers examples on Coastal Plain floodplains which lack clay sediment, where *Nyssa aquatica* is not a significant component of the canopy. They occur commonly both in sloughs of large blackwater rivers and filling the entire floodplain of many small streams.

The concept of the Blackwater Subtype has been narrowed from that in the 3rd Approximation, where it was defined to cover all streams with headwaters in the Coastal Plain. Here it includes only the most acidic and clay-free streams, most of which occur in the southern half of the state.

Distinguishing Features: The Cypress–Gum Swamp type is distinguished by canopy dominance by combinations of *Taxodium* and *Nyssa* in a nontidal river floodplain setting that is not impounded. The distinction from Tidal Swamp (Cypress–Gum Subtype) can be subtle on the edges of tidal influence and where tidal flooding is primarily from irregular wind tides. However, *Morella cerifera*, *Juniperus silicicola*, and many herbs associated with Tidal Freshwater Marsh communities are good indicators of tidal conditions. Tidal swamps usually have a more open canopy created by stress from rising sea level, but this is not always the case.

The Blackwater Subtype is distinguished from the Intermediate and Brownwater subtypes by the absence of *Nyssa aquatica* as a significant canopy component, and by a more acid-tolerant flora in general. It is distinguished from the Blackwater Cove Subtype by a lack of the distinctive open canopy, large buttresses, and deep flooding of that subtype, and corresponding lack of abundant *Cephalanthus occidentalis* and *Planera aquatica*. The Blackwater Subtype is distinguished from Coastal Plain Small Stream Swamp, where occurring on small stream floodplains, by the strong canopy dominance by *Nyssa* or *Taxodium* throughout the community (sometimes *Acer rubrum* in successional condition). Coastal Plain Small Stream Swamp is reserved for floodplain communities having a more mixed forest composition driven by more microsite heterogeneity or by shorter hydroperiod. The 3rd Approximation was ambiguous about how to treat the uniformly wet small stream floodplains, but they should be classified as Cypress–Gum Swamp.

Nonriverine Swamp Forest resembles the Blackwater Subtype more than other subtypes. Its setting is usually clearly not associated with a flowing river, but in ambiguous settings it may be distinguished by a more strongly acid-tolerant flora and dominant plants. While species such as *Lyonia lucida*, *Ilex glabra*, *Clethra alnifolia*, and *Smilax laurifolia* may occur in either community, they are usually moderate to dense in Nonriverine Swamp Forest.

Synonyms: *Taxodium distichum* - *Nyssa biflora* / *Fraxinus caroliniana* / *Lyonia lucida* Forest (CEGL004733).

Ecological Systems: Atlantic Coastal Plain Small Blackwater River Floodplain Forest (CES203.249).

Sites: The Blackwater Subtype occurs along rivers and streams that originate in sandy parts of the Coastal Plain and carry very little clay or silt. Blackwater floodplains vary substantially in their microrelief. Some larger rivers have well-developed ridge-and-swale systems, numerous sloughs,

terraces, and other evidence of widespread channel migration, though they have little natural levee development. In these complex floodplains, Cypress–Gum Swamp occurs in the lower portions, in sloughs and overflow channels. Small streams may sometimes have complex microtopography but may instead have flat featureless, floodplains which support Cypress–Gum Swamp throughout their width.

Soils: Soils in the Blackwater Subtype are typically a mix of sand and organic matter but some are deep organic material. Many are mapped as alluvial soils such as Muckalee or Bibb (Typic Fluvaquents) but many others are mapped as Johnson (Cumulic Humaquept) or Dorovan (Typic Haplosaprists).

Hydrology: Like other Cypress–Gum Swamps, the Blackwater Subtype is seasonally to frequently flooded, with water often lasting well into the growing season and potentially rising again at any season. The blackwater rivers that flood this subtype are tannin-stained but not turbid and usually are very acidic. Blackwater rivers tend to have more variable water levels than the larger brownwater rivers, so floods may be more frequent but have shorter duration.

Vegetation: The Blackwater Subtype is dominated by *Nyssa biflora*, generally along with *Taxodium distichum* or *Taxodium ascendens*. Other trees are scarce or absent from the canopy. The understory may be dominated by *Fraxinus caroliniana*, by *Acer rubrum* var. *trilobum*, *Persea palustris*, or rarely by tree-size *Cyrilla racemiflora*. It may contain small numbers of *Carpinus caroliniana*, *Fraxinus profunda*, *Liquidambar styraciflua*, *Quercus laurifolia*, or *Ilex opaca*. Shrubs may be sparse to moderate in density. Most constant in CVS plot data and field observations are *Cyrilla racemiflora* and *Eubotrys racemosa*. Also fairly frequent in plots are *Itea virginica*, *Clethra alnifolia*, and *Ilex myrtifolia*, while *Lyonia lucida*, *Vaccinium formosum*, *Cephalanthus occidentalis*, or *Alnus serrulata* may be present. Woody vines are often abundant. *Toxicodendron radicans*, *Smilax rotundifolia*, *Smilax walteri*, and *Smilax laurifolia* are most constant in plot data, while *Muscadinia rotundifolia*, *Smilax glauca*, *Bignonia capreolata*, and *Campsis radicans* are frequently observed in plots or in site reports. Herbs range from nearly absent to moderate in density. *Boehmeria cylindrica* is the most constant species. *Mitchella repens*, *Lorinseria areolata*, and *Osmunda spectabilis*, are frequent in plots. *Carex* spp. are collectively frequent; they include species shared with the Brownwater Subtype, such as *Carex louisianica*, *tribuloides*, *lupulina*, and *gigantea*, but also include species more typical of acidic wetlands such as *Carex glaucescens* and *radiata*. Other herbs may include *Ludwigia palustris*, *Biden discoides*, *Dulichium arundinaceum*, *Hypericum walteri*, *Mikania scandens*, *Pilea pumila*, *Persicaria hydropiperoides*, and other *Persicaria* species. *Hymenocallis crassifolia* or, on the Waccamaw River, *Hymenocallis pygmaea* may be locally abundant.

Range and Abundance: Ranked G3G4. This community is present on all of North Carolina's blackwater rivers and many of its smaller streams. The synonymized NVC association is attributed only to North Carolina and South Carolina. The conditions that give rise to the extreme development of blackwater become less prevalent farther south, and Coastal Plain rivers there are more closely related to the Intermediate Subtype.

Associations and Patterns: The Blackwater Subtype may occur as large patches, filling a featureless small to medium size floodplain. These may have a distinct channel, a network of

anastomosing channels, or have no visible channel at all. On larger rivers, it occurs as part of a floodplain mosaic with various subtypes of Blackwater Bottomland Hardwoods and other floodplain communities. In the downstream parts of large floodplains it may again dominate large featureless flats that fill most or all of the floodplain. It may grade downstream to Tidal Swamp.

Variation: Two variants are presently defined, but several other kinds of variation warrant investigation.

1. Typic Variant includes most examples on large rivers and small streams.
2. Waccamaw Variant includes swamps on the Waccamaw River as well as Juniper Creek and potentially other tributaries. These have *Cyrilla racemiflora*, *Lyonia lucida*, and *Ilex myrtifolia* as prominent components and lack *Fraxinus caroliniana*. Their vegetation suggests a transition from blackwater to nonriverine conditions, though they do not fit Nonriverine Swamp Forest better in their vegetation or environment. *Hymenocallis pygmaea*, an endemic species to the system, often is an abundant herbaceous component.

Within the Typic Variant, examples on large floodplains and those on smaller ones likely have somewhat different dynamics and may have differences in biota driven by them. Examples also vary in the relative amounts of *Taxodium* and *Nyssa*, which may be natural or may be a result of past logging. The occurrence of *Taxodium distichum* and *Taxodium ascendens* needs further clarification and may suggest variants.

Dynamics: As discussed for the Brownwater Subtype, the population dynamics of *Taxodium distichum* are distinctive. Stahle et al. (2012) confirmed the patchy age structure suggested by Mattoon (1915) as general for cypress. Reproduction thus appears to occur in uncommon episodes in different patches. Stahle et al. (1988) and Stahle et al. (2012) clarified the extreme longevity of *Taxodium distichum*. Under natural conditions, reproduction would not need to be very frequent to maintain its dominance. The conditions required for it are not known. Blackwater rivers and streams may undergo substantial channel migration, shifting microhabitats and creating new open areas where *Taxodium* could establish. However, it is not apparent that most patches in North Carolina are of such geologic origin. It is possible that the cycles of wetter or drier weather on the scale of 30 years documented by Stahle (1988) could affect it. *Taxodium* is more tolerant of inundation than other trees, including *Nyssa biflora*.

As in other Cypress–Gum Swamps, *Taxodium* often failed to regenerate after early logging, leaving most examples depleted in it. Regeneration appears limited in recently logged areas as well.

As in the other subtypes, downstream parts of the Blackwater Subtype are being affected by rising sea level and are developing into Tidal Swamp. Without substantial new sediment deposition to raise ground levels as sea level rises, tidal influence often extends farther up backwater rivers than brownwater.

Comments: Stahle et al. (2012) (and ongoing work) have documented the extreme age of cypress trees in this subtype along the Black River. Trees exceeding 2600 years old have been found, some of the oldest nonclonal plants in the world.

Nyssa biflora - (*Taxodium distichum*) Semi-natural Forest (CEGL004640) was defined as an association for modified versions of this subtype, where *Taxodium* has been removed by logging. It is now inactive and not treated as a standard association. It is generally impossible to determine how much *Taxodium* was present before early logging. Remnants of decay-resistant stumps suggest it was a patchy minority component even long ago, but it is not clear if this reflects conditions before the first logging. For conservation purposes, all examples should be regarded as the same subtype, in varying conditions.

Rare species: Vascular plants: *Acmella repens*, *Bacopa caroliniana*, *Ditrysinia fruticosa*, *Hymenocallis pygmaea*, *Ponthieva racemosa*, *Rhynchospora decurrens*, *Sabatia kennedyana*, *Sagittaria filiformis*, and *Sagittaria weatherbiana*.

Vertebrate animals: *Anhinga anhinga*, *Mycteria americana*. *Elassoma boehlkei*, *Enneacanthus obesus* and other rare fish of blackwater rivers use Cypress–Gum Swamps when they are flooded.

References:

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